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EV313985412US

DATE OF DEPOSIT: December 1, 2003

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UNITED STATES PATENT APPLICATION

FOR

TRENCH SHIELD LADDER

TRENCH SHIELD LADDER

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a ladder for use with a trench shield to allow the user to climb down the ladder into a trench located within the walls of the trench shield. More specifically, the present invention is a ladder that is movable with the trench shield when the trench shield is pulled through a trench
10 and can be lengthened with an extension so that the ladder is of the desired length when trench shields are stacked on top of each other for use in deep trenches. The present ladder meets applicable safety standards, and usage of this ladder can prevent injuries that often occur when using other types of ladders in this type of service.

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2. Description of the Related Art

When workmen need to work in a trench in the ground, such has for example when laying cable or pipe or when doing repair work on underground
20 lines, a trench shield is employed to prevent the sides of the trench from caving in and burying the workmen. Trench shields are made of two parallel walls that are held approximately 3 feet or more apart so that the workmen can work

between the walls. The walls are approximately 8 feet tall and are strong enough to shield the workmen from a possible collapse of the trench walls. The walls are also several feet in length. The most common lengths are 8, 12, 16, 20 and 24 feet.

5 Currently, in order for workmen to climb down the walls of the trench shield to enter the trench, they must climb down a traditional straight ladder that has been placed into the trench between the walls of the trench shield. Use of a traditional straight ladder presents several safety problems. First, if the trench is deep, often a pair of trench shields will be employed so that one trench shield is
10 stacked on top of the other one. Often a straight ladder is not long enough to safely use in these deep trenches.

Second, in order to use a straight ladder, safety regulations require that the ladder be tied off so that it does not tip when the workmen are on the ladder and does not fall in on top of them when they are in the trench.

15 As work is completed in one section of the trench, it is normally necessary to move the trench shield to another section of the trench by dragging it through the trench. When a traditional straight ladder is employed with a trench shield, the lower end of the ladder rests on the bottom of the trench. In order to safely move the trench shield along the trench, the ladder must first be untied from the
20 trench shield and then pulled out of the trench shield. Then it is safe to pull the trench shield through the trench to its new location. After the trench shield has been moved, the straight ladder is then reinserted between the trench shield

walls and is again tied off. This is a time consuming procedure and workmen will often become lazy and not take the time to perform this procedure in a safe manner. For example, they may instead push the straight ladder out the back end of the trench shield so that the trench shield can be moved without removing
5 the ladder from the trench. If they are in the trench when they push the ladder outside of the trench shield, they often place themselves at risk because once they are beyond the walls of the trench shield, they are no longer protected from falling debris and a possible cave in of the sides of the trench. Also, once the ladder is placed outside the walls of the trench shield, workmen will often use the
10 ladder in that unprotected location rather than take the time to reposition the ladder within the trench shield and properly tying the ladder to the trench shield. Workmen have been injured and killed by falling rocks and trench cave ins while they were in a trench but outside the protective walls of the trench shield.

The present invention addresses these problems by providing a ladder
15 that can be extended to the desired length to permit safe access to any depth of trench shield and trench. The present invention also rests on the upper lip of the trench shield instead of the bottom of the trench and therefore can be moved with the trench shield. The present ladder fits securely over the upper lip of the trench shield and is held in place by gravity so that it is not necessary to tie the ladder to
20 the trench shield to insure that the ladder is stable and does not fall sideways or drop off of the upper lip of the trench shield. Further, the present invention is provided with a safety platform at the top of the ladder and rails that extend over

the top of the ladder to make it safe and easy for the workmen to climb into and out of the trench. Still further, the present invention is provided with stand off arms so that the workmen can fully engage the main and extension rungs of the ladder with their feet along the entire length of the ladder. The present invention
5 is designed to fit on trench shields of varying thicknesses, easily fitting on the common trench thicknesses of approximately 4 inches and approximately 8 inches.

SUMMARY OF THE INVENTION

The present invention is a trench shield ladder that attaches to the top lip of a trench shield and hangs on the wall of the trench shield to provide workmen safe access to the trench. Because the ladder hangs on the wall of the trench shield, it is moved with the trench shield as the trench shield is pulled through the trench. Also, because the ladder fits securely over the upper lip of the trench shield and is held in place by gravity, it is not necessary to tie the ladder to the trench shield to insure that the ladder is stable and does not fall sideways or drop off of the upper lip of the trench shield.

Still further, the present invention is provided with stand off arms so that the workmen can fully engage the main and extension rungs of the ladder with their feet along the entire length of the ladder. The present invention is designed to fit on trench shields of varying thicknesses, easily fitting on the common trench thicknesses of approximately 4 inches and approximately 8 inches.

Further, the present invention is provided with a safety platform at the top of the ladder and hand rails that extend approximately 36 inches over the platform of the ladder to make it safe and easy for the workmen to climb into and out of the trench.

The ladder can be extended to the desired length to permit safe access to various depths of trench and various heights of trench shield and by use of an extension portion of the ladder. The extension portion is provided with hooks on the upper end of the legs of the extension portion so that the hooks can be

looped over any of one the main rungs of the ladder to thereby allow the ladder to be extended to any length desired. The extension portion is not as wide as the main portion of the ladder so that the legs of the extension rest between the legs of the main portion of the ladder when the extension portion is in use. The

5 extension portion hangs from the main portion of the ladder via gravity and is provided with stand off arms similar to the stand off arms provided on the main portion of the ladder.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a trench shield ladder constructed in accordance with a preferred embodiment of the present invention with the location of an extension portion shown in outline and with a portion of the top platform cut away to reveal the supporting framework.

FIGURE 2 is a perspective view of the extension portion of Figure 1, shown with the main portion of the trench shield ladder shown partially cut away in outline.

FIGURE 3 is a front elevation of the trench shield ladder of Figure 1 shown attached to a wall of a trench shield.

FIGURE 4 is a side view of the trench shield ladder of Figure 3.

FIGURE 5 is a top plan view of the trench shield ladder of Figures 3 and 4.

FIGURE 6 is a front elevation of the lower end of the trench shield ladder showing the extension portion in use.

FIGURE 7 is a side view of the lower end of the trench shield ladder and extension portion of Figure 6.

FIGURE 8 is a top view of the lower end of the trench shield ladder and extension portion taken along line 8-8 of Figure 6.

5 FIGURE 9 is a perspective view of the trench shield ladder in combination with a trench shield.

FIGURE 10 is a side view of the trench shield ladder in combination with the trench shield of Figure 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

THE INVENTION

Referring now to the drawings and initially to Figures 1 and Figures 3-5, there is illustrated a main portion **10** of a trench shield ladder **12** that is constructed in accordance with a preferred embodiment of the present invention. This trench shield ladder **12** can be extended in length by employing an extension portion **14**, as shown in outline in Figure 1. Figure 2 illustrates the extension portion **14** and shows the main portion **10** of the trench shield ladder **12** in outline. Both the main portion **10** of the ladder **12** and the attached extension portion **14** are illustrated in Figures 6-8.

As illustrated in Figures 1 and 3-5, the main portion **10** of the ladder **12** is provided with two front legs **15A** and **15B** that extend vertically downward approximately parallel to each other on a front side **16** of the ladder **12**. Spaced apart ladder main rungs **18** are provided extending approximately horizontally between the two legs **15A** and **15B** on the front side **16** of the ladder **12**. The two legs **15A** and **15B** continue at the top end **20** of the ladder **12** as a pair of inverted u-shaped hand rails **22A** and **22B** that extend over a top platform **24** of the ladder **12** and terminate on a back side **26** of the ladder **12** as two rear legs **28A** and **28B** that extend vertically downward approximately parallel to each other and approximately parallel with the two front legs **15A** and **15B**.

Stand off arms **30** for removably engaging an inwardly facing surface **31** of a wall **32** of a trench shield **34** are provided on the two front legs **15A** and **15B** so

that the stand off arms **30** extend rearward from the front legs **15A** and **15B** and are approximately perpendicular to the front legs **15A** and **15B**. A foot **36** is provided on a distal end **38** of each stand off arm **30** for engaging the inwardly facing surface **31** of the wall **32** of the trench shield **34** when the ladder **12** is in use. The stand off arms **30** hold the front legs **15A** and **15B** of the ladder **12** away from the wall **32** of the trench shield **34** so that the workmen can fully engage the main rungs **18** of the ladder **12** with their feet along the entire length of the ladder **12** as they ascend and descend the ladder **12**.

When in use, the rear legs **28A** and **28B** of the ladder **12** extend on the outside of the trench shield **34** and engage an outwardly facing surface **38** of the trench shield wall **32**, and the front legs **15A** and **15B** extend into a trench **40** adjacent the inwardly facing surface **31** of the wall **32** of the trench shield **34** so that the feet **36** of the stand off arms **30** contact the inwardly facing surface **31** of the wall **32** at least at a lower end **42** of the main portion **10** of the ladder **12**. The stand off arms **30** and the rear legs **28A** and **28B** are separated a sufficient distance so that the ladder **12** can be employed with trench shields **34** having walls **32** of various thicknesses, with thicknesses of 4 inches and 8 inches being the most common thicknesses currently employed.

Although the drawings illustrate that the ladder **12** hangs on the wall **32** of the trench shield **34** so that all of the feet **36** of the stand off arms **30** engage the inwardly facing surface **31** of the wall **32** of the trench shield **34**, i.e. both at the top and lower ends **20** and **42** of the main portion **10** of the ladder **12**, this is only

possible when the wall **32** of trench shield **34** is at the higher end of the range of thicknesses accommodated by the ladder **12**. For trench shield walls **32** of lesser thicknesses, the feet **36** on the top end **20** of the ladder **12** will not engage the inwardly facing surface **31** of the wall **32** of the trench shield **34**, but the feet
5 **36** on the lower end **42** will engage the inwardly facing surface **31** of the wall **32** and the rear arms **28A** and **28B** will engage the outwardly facing surface **38** of the wall **32** on the other side of the same wall **32** to hold the ladder **12** stable as the ladder **12** hangs on the wall **32**.

Because the ladder **12** hangs over the wall **32** of the trench shield **34**, it is
10 moved with the trench shield **34** as the trench shield **34** is pulled longitudinally through the trench **40**. Also, because the ladder **12** fits securely over the wall **32** of the trench shield **34** and is held in place by gravity, it is not necessary to tie the ladder **12** to the trench shield **34** in order to insure that the ladder **12** remains stable and does not fall sideways or drop off of the wall **32** of the trench shield
15 **34**.

The top platform **24** is supported by a frame **44** that extends between the two front legs **15A** and **15B**, between the two rear legs **28A** and **28B** and between the front and rear legs, i.e. between legs **15A** and **28A** and between legs **15B** and **28B**. The platform **24** has a cover **46** that can safely hold the
20 weight of a workman as the workman steps onto the platform **24** while entering and leaving the trench **40** via the ladder **12**. Each of the inverted u-shaped hand rails **22A** and **22B** is preferably approximately 36 inches in height so that they

provide a safe handhold for workmen as the workmen descend and ascend the ladder **12**.

The ladder **12** may be used with only the main portion **10** attached to the wall **32**, or alternately, with the main portion **10** attached to the wall **32** and the extension portion **14** attached to the main portion **10**, depending on the depth **48** of the trench **40**. The depth **48** of the trench **40** is illustrated in Figures 3 and 4. Obviously, the depth **48** of the trench **40** will also dictate the total height of the trench shield **34**, or alternately, the total height of a pair of stacked trench shields **34** with which the ladder **12** is employed.

Referring now to Figures 2, and 6-7, the extension portion **14** of the ladder **12** will be described. The ladder **12** can be extended to the desired length to permit safe access to various depths **48** of trenches and various heights of trench shields by use of the extension portion **14** of the ladder **12**. The extension portion **14** is provided with two approximately vertical and approximately parallel extension legs **50A** and **50B** and with spaced apart extension rungs **52** extending approximately horizontally between the two extension legs **50A** and **50B**.

Each of the extension legs **50A** and **50B** is provided with an inverted u-shaped hook **54** on the upper end **56** of the extension legs **50A** and **50B** so that the hooks **54** can be looped over any one of the main rungs **18** of the main portion **10** of the ladder **12** to thereby hang the extension portion **14** onto the ladder **12** onto the main portion **10**, and thereby allowing the ladder **12** to be extended to any total length desired. The extension portion **14** is not as wide as

the main portion 10 of the ladder 12 so that the extension legs 50A and 50B hang between the front legs 15A and 15B of the main portion 10 of the ladder 12 when the extension portion 14 is in use. The extension portion 14 hangs from the main portion 10 of the ladder 12 via gravity and is provided with stand off arms 58 and associated feet 60 that are similar in structure and function to the stand off arms 30 and feet 36 provided on the main portion 10 of the ladder 12.

Combination Ladder and Trench Shield

Referring to Figures 9 and 10, there is shown the trench shield ladder 12 in combination with the trench shield 34 with which it is employed. The trench shield 34 is provided with two spaced apart planar panels or walls 32 and 33 that are approximately parallel with each other. The trench shield 32 is provided with a plurality of support rods 62 extending between and secured to the two walls 32 and 33. The support rods 62 serve to hold the walls 32 and 33 apart so that a working space 64 is provided between the planar walls 32 and 33. The purpose of the trench shield 34 is to provide a safe environment for workmen who must work in a trench in the ground. By placing the trench shield 34 into the trench, the walls 32 and 33 serve to prevent the sides of the trench from caving in on the workmen as they are working in the bottom of the trench.

While the invention has been described with a certain degree of particularity, it is manifest that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure. It is understood that the invention is not

limited to the embodiments set forth herein for the purposes of exemplification, but is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element thereof is entitled.